AN ANALYTICAL APPROACH TO IDENTIFYING RADIAL LINEAMENTS ASSOCIATED WITH THE THARIS REGION OF MARS. **Anderson, R. C. and Peer, B. J., Department of Geology and Planetary Science, University of Pittsburgh, PA 15260.**

Introduction: The most dominant tectonically controlled region on Mars is the Tharsis bulge. Asymmetrical in shape, this extensive plateau is 6-10 km high and 4000 km in diameter. Associated with the bulge is a vast array of volcanic and tectonic features such as grabens, normal faults, and lunar-like wrinkle ridges. The faults and grabens display a radial pattern which has lead previous researchers to conclude a relationship exists between the bulge and the faulting [1, 2, 3, 4]. Numerous studies on the orientation of the faults, grabens, and ridges have been performed for the Tharsis bulge [1, 5, 6, 7, 8, 9, 10, 11]. These studies have concluded that the tectonic features do not display a "pure" radial pattern indicating a single center, but instead may have multiple centers [1, 2, 8]. In this study a quantitative approach has been used to recognize possible centers of radial tectonic features associated with the Tharsis bulge. Lineaments were digitized for the central Tharsis region (30° N and 30° S latitude; 45° W to 157.5° W longitude). A lineament is defined as any "linear" feature that can be identified and mapped. For the Tharsis region this includes faults, grabens, and ridges. Centers were identified by the greatest concentration of radially projected lineaments.

Technique: Seventeen thousand lineaments were digitized from twenty 1:2,000,000 scale photomosaic maps in mercator projection. Length and angle, (relative to a line of longitude), was calculated for each lineament, taking into account the ellipticity of Mars. The study area was then divided into a grid with five degree square cells. Lineaments were extended as great circles and the number of lineaments radial to each grid cell was determined. The grid cell which contained the greatest amount of radial lineaments was chosen as the primary center of the region. Once the primary center was identified, the lineaments associated with the primary center were removed from the dataset and the cell counting procedure was reiterated to find secondary centers. For better visual interpretation of data, contour maps of primary and secondary centers were created (Figure 1 and 2).

Results: The greatest concentration of lineaments (4489) projected radially to a center **A** located at -5° S, -105° W (Figure 1). This region is associated within the Noctis Labyrinths region due north of Syria Planum. The location of this center agrees with previous estimates of the center of the Tharsis Dome [1, 2, 8]. Center **B** is located at -15° S, -70° W and contains 2344 radially projected lineaments. This center is located within the Valles Marineris region. Center **C** is located longitudinally similar to Center **B**. This center is located at 25° N, -70°W and contained 2199 lineaments.

The reiteration minus the lineaments associated with center A produced an additional center with a similar concentration of lineaments (Figure 2). Center **D** is located at -15°S, -115°W and contained 2051 radially projected lineaments. This center is located southwest of Syria Planum and Center **A.** Centers **B** and **C** are relatively unaffected by removal of the lineaments of Center **A**.

Preliminary Conclusion: Center **A** in Figure 1 clearly demonstrates that this center is the dominant center present for the Tharsis bulge. This center is located at -5° S, -105° W and contained twice the number of lineaments projected to Centers **B**, **C**, and **D**. Centers **B** and **C** are ruled out as possible candidates for centers because a majority of the lineaments radially projected to these centers were identified as ridges associated with the Lunae Planum region. Ridges are compressional features and are not projected to a radial

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pattern. Center **D** is a strong candidate for a second tectonic center. It is located at -15°S, -115°W and contains 2254 radially projected lineaments. Further research is underway to correlate these centers with the Martian stratigraphic units.

References: [1] Wise, D.U. et al (1979) JGR 84, 7934; [2] Banerdt, W.B. et al (1982) JGR 87, 9723; [3] Plescia, J.B. and Saunders, R.S. (1982) JGR 87, 9775; [4] Tanaka, K.L. et al (1991) JGR 96 (E1), 15617; [5] Scott, D.H. and Tanaka, K.L. (1980) Proc. Lunar. Planet. Sci. Conf. 11th, 2403; [6] Masson, P. (1980) Moon Planets 22, 211; [7] Maxwell, T.A. (1982) JGR 87, 97; [8] Anderson, R.C. (1993) Proc. Lunar. Planet. Sci. Conf. 24th, 33; [9] Watters, T.R. and Maxwell, T.A. (1986) JGR 91, 8113; [10] Tanaka, K.L. and Davis, P.A. (1988) JGR 93, 14893; [11] Golombeck, M.P. et al (1991) Proc. Lunar. Planet. Sci. Conf. 21st, 679.

Figure 1. CONTOUR MAP OF RADIAL CENTERS (*full dataset,* grid spacing: 5°, contour interval: 200)

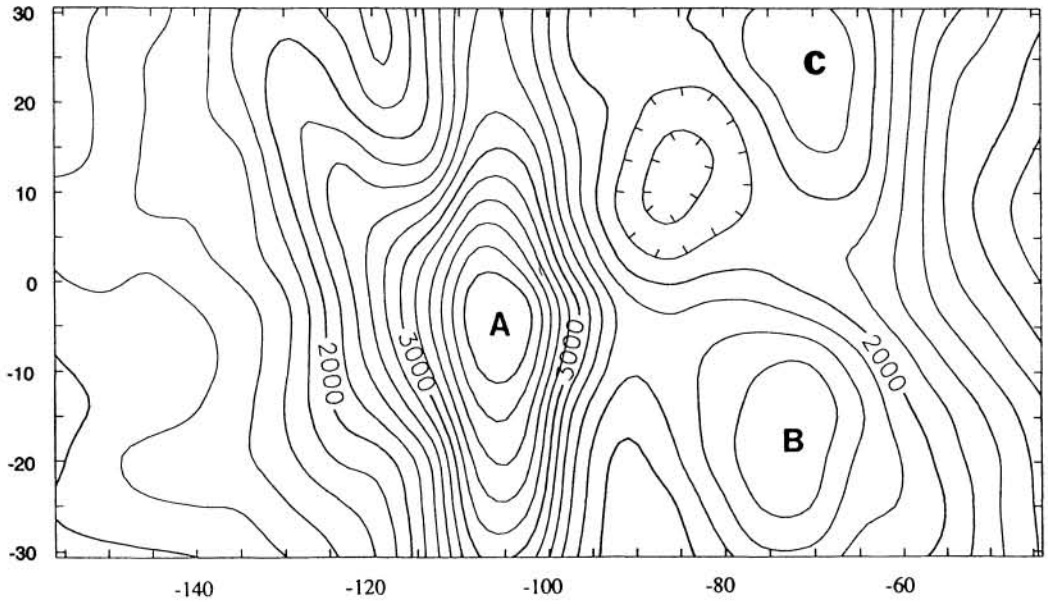

Figure 2. CONTOUR MAP OF RADIAL CENTERS (*reduced dataset,* grid spacing: 5°, contour interval: 200)